

A Statistical Model of Central Valley Chinook Incorporating Uncertainty

Cathy Lawrence

Final Selection Panel Review

Proposal Title

#0214: A Statistical Model of Central Valley Chinook Incorporating Uncertainty

Funding:

Fund in part

Amount: \$679,631

The final Selection Panel concurred with its initial findings on this proposal. Due to the reduction in funds available for the Science Program's 2004 PSP, the Selection Panel recommended funding for this proposal be reduced by 10%. Should the California Bay-Delta Authority accept the Selection Panel's recommendation and approve the funding of this proposal, the applicant will be allowed to negotiate which tasks and associated costs will be reduced by 10% as part of the contracting process.

Public Comments

No public comments were received for this proposal.

Initial Selection Panel Review

Proposal Title

#0214: A Statistical Model of Central Valley Chinook Incorporating Uncertainty

Funding:

Fund

Amount: \$754,631

Initial Selection Panel (Primary) Review

Topic Areas

- Life Cycle Models And Population Biology Of Key Species
- Environmental Influences On Key Species And Ecosystems
- Relative Stresses On Key Fish Species
- Salmonid–related Projects

Please describe the relevance and strategic importance of this proposal in the context of this PSP. How does the proposal address the topic areas identified above? What are the broader CALFED Goals this proposal may meet that are not accounted for in these specific topic areas?

Given the fragmented or simplistic efforts that have gone into most salmon modeling for the CV to date this proposal is refreshing; albeit daunting as being way beyond my level of understanding. Achieving some realistic model that could allow better determination of when different factors pose threats to salmon population and the degree of those threats has been the will-o-the-wisp of CV salmon management. This proposal might provide a major step out of our current morass or it might be dismissed as a black box model with no relationship to the real world. Bayesian models are a rising star in the modeling world and CV salmon are an obvious candidate for their use due to the complexity and multiplicity of factors affecting them.

The budgets of proposals submitted in response to this PSP are larger, on average, than those

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Initial Selection Panel Review

submitted to CALFED in previous years. The Science Program is committed to getting as much science per dollar as is reasonably possible. With this commitment in mind, can the proposed budget be streamlined? If so, please recommend and clearly justify a new budget total in the space provided.

This was seen by most reviewers as an expensive modeling proposal. One thought that a partial proposal would be useful but another felt that anything less than the full effort would be pointless.

Evaluation Summary And Rating.

Provide a brief explanation of your summary rating and any additional comments you feel are pertinent.

If part of this could be funded and shown to be credible, I think that funding agencies would fall over themselves to fund the rest. Given severe restrictions on the amount of money available under this PSP I am uncomfortable recommending full funding, but am happy to defer to more knowledgeable members of the panel.

Selection Panel (Discussion) Review

fund this amount: \$754,631

note:

fund

This proposes developing an array of interconnected models, adding data from physiological and bioenergetic studies.

The Panel was enthusiastic about the need for this type of work, and about the proposal. They suggested that this would be a great collaboration, combining technical strengths with an ability to look at the big picture.

Some concern was expressed about whether this would be useful for management. Currently, a winter-run spreadsheet model for MWD is about the best we have. This work would represent a significant step forward, and would potentially not only

Initial Selection Panel Review

identify recovery opportunities, but would also identify the largest uncertainties and their sources. It is the type of work that was recommended by the EWA Panel.

Panel Ranking: Fund.

Technical Synthesis Panel Review

Proposal Title

#0214: A Statistical Model of Central Valley Chinook Incorporating Uncertainty

Final Panel Rating
superior

Technical Synthesis Panel (Primary) Review

TSP Primary Reviewer's Evaluation Summary And Rating:

The project "A Statistical Model of Central Valley Chinook Incorporating Uncertainty" seeks to accomplish two general goals: 1. to formulate a modeling approach to threatened Central Valley chinook salmon runs, that accounts for mortality in all life stages, including the ocean, and that also accounts for both the variability in each stage, and the uncertainty in our understanding of each stage. The model will be used to develop an effective means of expressing population viability and a specific set of population criteria under which the Threatened and Endangered populations could be considered to be recovered. 2. to develop a methodology of decision making that will allow decision makers to achieve recovery goals for the Central Valley salmon runs in a way that accounts for uncertainty, and also a parallel methodology that will suggest how decision makers can design data collection and designate research priorities on Central Valley salmonids in a way that reduces uncertainty most rapidly. 1. Goals: Goals and questions to be answered by the study were very clearly presented. The questions to be answered are very timely and important given the current state of Central Valley chinook salmon. 2. Justification: The study is justified with regards to existing knowledge. A valuable part of the study is to assess mortality rates in the ocean and potentially related variables, and it appears as though little information is

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Technical Synthesis Panel Review

available on mortality during this life stage relative to freshwater stages. The study will also evaluate the value of potential monitoring of ocean conditions, so that managers will be able to decide whether spending funds on monitoring can aid in management decisions. The final model will be valuable to managers, as it should allow them to predict outcomes of various management schemes. One technical reviewer wrote: "I am not so sure about the very expensive full-scale implementation. I think that the project rests on a lot of assumptions and it would be better to move step by step instead of with the full implementation." 3. Approach: I believe the models that will be used are an appropriate approach for this research. These models should aid managers in making decisions. The researchers acknowledge a lack of data and estimates of uncertainty for some parameters, but they plan on taking appropriate steps to account for these problems, particularly with Bayesian statistics. Using lab experiments to adjust adult model parameters for juveniles is also wise. One external reviewer wrote, "The approach seems well thought out and is appropriate. It will rely on many modeling assumptions, and it is not clear to me how much will have to be assumed without reasonable evidence. Nevertheless, the approach is worth trying, and will generate some useful information for managers. This might take the form of indicating crucial areas where more data are required." 4. Feasibility: Given the expertise of the authors and the detail in the proposal, this study seems likely to succeed. The approach is very well documented and technically feasible to carry out. External reviewers were also confident that the study would succeed. 5. Monitoring: NA 6. Products: The authors' plans for an interactive website will yield a valuable product for managers. The work should be publishable. Some products of value will come from the project, and these will contribute useful information to management. I am uncertain as to the extent to which the outcomes will be interpretable. One external reviewer wondered if the model might just be a black box involving a lot of unverifiable assumptions, so that managers are uncertain of the extent that they can trust the use of it. On the other hand if the assumptions of the model can all be justified then it would be extremely useful at least as a start towards representing what

Technical Synthesis Panel Review

is really going on. 7. Capabilities: The research team appears capable. The track records of the authors are very good and they are certainly qualified to effectively implement the proposal. The infrastructure and support needed are available. 8. Budget: The budget appears reasonable. One technical reviewer thought it may be a bit too high.

Additional Comments:

My thoughts generally aligned with the reviewers'. One reviewer was more apprehensive than I, which may be from his greater experience with potential modeling difficulties. The external reviewers seemed to agree that the study was interesting and worth carrying out because the outcomes may be useful to managers. One reviewer was concerned about the amount of money requested for a modeling study, and another reviewer was concerned about the difficulties of explaining the methods and results to managers. On average, they rated the proposal as Very Good to Excellent.

The project "A Statistical Model of Central Valley Chinook Incorporating Uncertainty" seeks to accomplish two general goals: 1. to formulate a modeling approach to threatened Central Valley chinook salmon runs, that accounts for mortality in all life stages, including the ocean, and that also accounts for both the variability in each stage, and the uncertainty in our understanding of each stage. The model will be used to develop an effective means of expressing population viability and a specific set of population criteria under which the Threatened and Endangered populations could be considered to be recovered. 2. to develop a methodology of decision making that will allow decision makers to achieve recovery goals for the Central Valley salmon runs in a way that accounts for uncertainty, and also a parallel methodology that will suggest how decision makers can design data collection and designate research priorities on Central Valley salmonids in a way that reduces uncertainty most rapidly. 1. Goals: Goals and questions to be answered by the study were very clearly presented. The questions to be answered are very timely and important given the current state of Central Valley

Technical Synthesis Panel Review

chinook salmon. 2. Justification: The study is justified with regards to existing knowledge. A valuable part of the study is to assess mortality rates in the ocean and potentially related variables, and it appears as though little information is available on mortality during this life stage relative to freshwater stages. The study will also evaluate the value of potential monitoring of ocean conditions, so that managers will be able to decide whether spending funds on monitoring can aid in management decisions. The final model will be valuable to managers, as it should allow them to predict outcomes of various management schemes. One technical reviewer wrote: "I am not so sure about the very expensive full-scale implementation. I think that the project rests on a lot of assumptions and it would be better to move step by step instead of with the full implementation." 3. Approach: I believe the models that will be used are an appropriate approach for this research. These models should aid managers in making decisions. The researchers acknowledge a lack of data and estimates of uncertainty for some parameters, but they plan on taking appropriate steps to account for these problems, particularly with Bayesian statistics. Using lab experiments to adjust adult model parameters for juveniles is also wise. One external reviewer wrote, "The approach seems well thought out and is appropriate. It will rely on many modeling assumptions, and it is not clear to me how much will have to be assumed without reasonable evidence. Nevertheless, the approach is worth trying, and will generate some useful information for managers. This might take the form of indicating crucial areas where more data are required." 4. Feasibility: Given the expertise of the authors and the detail in the proposal, this study seems likely to succeed. The approach is very well documented and technically feasible to carry out. External reviewers were also confident that the study would succeed. 5. Monitoring: NA 6. Products: The authors' plans for an interactive website will yield a valuable product for managers. The work should be publishable. Some products of value will come from the project, and these will contribute useful information to management. I am uncertain as to the extent to which the outcomes will be interpretable. One external reviewer wondered if the model might just be a black box involving a lot of unverifiable

Technical Synthesis Panel Review

assumptions, so that managers are uncertain of the extent that they can trust the use of it. On the other hand if the assumptions of the model can all be justified then it would be extremely useful at least as a start towards representing what is really going on. 7. Capabilities: The research team appears capable. The track records of the authors are very good and they are certainly qualified to effectively implement the proposal. The infrastructure and support needed are available. 8. Budget: The budget appears reasonable. One technical reviewer thought it may be a bit too high.

Technical Synthesis Panel (Discussion) Review

TSP Observations, Findings And Recommendations:

A statistical model of Central Valley Chinook incorporating uncertainty

The primary reviewer ranked this proposal as above average to excellent. There is a large team of excellent scientists identified for this work. This model would provide valuable information for managers to help prioritize management actions. The secondary reviewer ranked the proposal as superior. The panel felt the proposal was strong in addressing the importance of uncertainty in complex models. The panel judged the proposal to be informationally dense, but investigators showed a clear attempt to communicate intricacies of Bayesian modeling. The panel recognized the investigators effort address the problems of communicating modeling complexities to managers. The proposal was thought to be well integrated and extremely relevant for understanding and managing Central Valley Chinook in the future.

Final Ranking: Superior

Technical Review #1

proposal title: A Statistical Model of Central Valley Chinook Incorporating Uncertainty

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	The goals, objectives, and hypotheses are clearly stated and internally consistent. The ideas are timely and important.
Rating	excellent

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

Comments	The study is justified relative to existing knowledge. The conceptual model is clearly stated and explains the underlying basis for the proposed work. The selection of research is well-justified.
Rating	excellent

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	The approach is well-designed and appropriate. The results are likely to add to the knowledge base. It is
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Technical Review #1

	likely to generate novel methods and approaches. The information will be useful to decision-makers.
Rating	excellent

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success?
Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	The approach is well documented and technically feasible. Its likelihood of success is high. The scale is consistent with objectives and well within the grasp of the authors.
Rating	excellent

Monitoring

If applicable, is monitoring appropriately designed (pre–post comparisons; treatment–control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	The monitoring is well-designed, and there are well-defined plans to interpret the monitoring data (e.g., near-shore conditions vs. smolt-to-adult survival).
Rating	excellent

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	The products will likely be valuable for management decisions. Contributions to larger data management systems are relevant and well-considered. Interpretable outcomes, while difficult to communicate due the complexity of Bayesian analyses, are likely
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Technical Review #1

	and well documented.
Rating	very good

Additional Comments

Comments

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	The authors have excellent track records. The project team is well qualified to implement the project. They have infrastructure and support needed to complete the project.
Rating	excellent

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	The budget appears reasonable and adequate for the work proposed.
Rating	excellent

Overall

Provide a brief explanation of your summary rating.

Comments	Nearly all aspects of the project are very well thought out. My only reservation is that explaining the methods and results from the Bayesian analyses will likely to be an uphill battle, because the methods are both very complex and are likely unfamiliar to non-specialist audiences.
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Technical Review #1

Rating	excellent
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Technical Review #2

proposal title: A Statistical Model of Central Valley Chinook Incorporating Uncertainty

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	<p>The idea is certainly timely and important, and the methods are precedented.</p> <p>My first read of the executive summary left me with many questions, but the methods required for developing the parameters for the life-history model are quite varied and not easy to describe succinctly. There is a bit of a blur between the goals and the methods. This project is a synthesis of several components.</p>
Rating	good

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

Comments	<p>They have gone to great efforts to tie in the literature with the current study. In some ways this is a great strength of the proposal. There is a lot of background that supports this work and they have found it!</p> <p>Completion of this entire task and all of its sub-elements should be required because the model and its implementation do go hand in hand. This will NOT</p>
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Technical Review #2

	be useful to the region if it is incomplete.
Rating	excellent

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	<p>The approach is a good one and quite feasible. In a sense, the life-history model can be built on the back of an envelope as a "null" model and then improved in any all details. That is certainly a strength of the bayesian approach which allows updating at many stages.</p> <p>The results may or may not be useful. From the funder's perspective there may be decision-making implications that are out of their control, and therefore may be of less interest. On the Snake/Columbia system, river managers must not account for improvements outside of their immediate influence. Thus, tributary enhancements to survival (and overall survival) are welcome but independent of their responsibility within the river corridor.</p>
Rating	very good

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	<p>Yes this a feasible project.</p> <p>However, "Likelihood of success" is ambiguous. The project can be completed and the leading cause of uncertainty not found because the data does not</p>
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Technical Review #2

	<p>support such analysis. This seems unlikely, but the success of the effort to create the model and the success of the model to lead to good decisions are quite different measures.</p> <p>I am confident that the group has the expertise to accomplish the task. They certainly have a lot of background work completed already.</p>
Rating	very good

Monitoring

If applicable, is monitoring appropriately designed (pre–post comparisons; treatment–control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	<p>Definitely to develop such information. In fact that is possibly the greatest value to the region: suggesting what the relative values of different monitoring guidelines will be to the future of the CV stock.</p> <p>This study will rely on a vast amount of data already available and may suggest changes to data collection priorities.</p>
Rating	very good

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	<p>The generation of a web-based interactive model to allow others to explore the interaction of model elements is very valuable. It brings many more people (stakeholders) into the process.</p>
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Technical Review #2

	<p>The proposal was a daunting 101 pages and the 20 page project proposal summary was very high density(!)</p> <p>Much of the framework and background for this is already begun. This project will put all of the pieces together.</p>
Rating	excellent

Additional Comments

Comments

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	Yes. This is a well qualified group with strong credentials.
Rating	excellent

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	Yes. Much of this is dispersed to sub-contractors for particular components but there is much benefit in connecting to a University where PI's are housed already, and they do this.
Rating	very good

Overall

Provide a brief explanation of your summary rating.

Comments	Modeling efforts are extremely valuable because a well
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Technical Review #2

	<p>formulated model will allow the user to conduct many experiments with no risk to the system being modelled. In fact that is ultimately a goal of the project to make the model available of anyone to perform these experiments, although of course full access to Monte-Carlo simulations can not be allowed with a web-based, general access model.</p> <p>These efforts will be watched by managers in other regions.</p>
Rating	excellent

Technical Review #3

proposal title: A Statistical Model of Central Valley Chinook Incorporating Uncertainty

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	Yes, the proposal is reasonable in all of these respects.
Rating	very good

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

Comments	The study is justified and the underlying basis for the work is clear. I am not so sure about the very expensive full-scale implementation. I think that the project rests on a lot of assumptions and it would be better to move step by step instead of with the full implementation.
Rating	very good

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	
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Technical Review #3

	The approach seems well thought out and is appropriate. It will rely on many modeling assumptions, and it is not clear to me how much will have to be assumed without reasonable evidence. Nevertheless, the approach is worth trying, and will generate some useful information for managers. This might take the form of indicating crucial areas where more data are required.
Rating	very good

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success?
Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	The approach is very well documented and technically feasible to carry out. If success means carrying out the stated tasks then there is a very high chance of success. The authors of the proposal seem very knowledgeable so they can certainly do the work. I am not sure about the scale of the project, as it seems very expensive for a model building exercise.
Rating	very good

Monitoring

If applicable, is monitoring appropriately designed (pre–post comparisons; treatment–control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	Not really appropriate for this type of project.
Rating	very good

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Technical Review #3

Comments	Some products of value will come from the project, and these will contribute useful information to management. I am uncertain as to the extent to which the outcomes will be interpretable. What I mean by this is that the model might just be a black box involving a lot of unverifiable assumptions, so that managers are uncertain of the extent that they can trust the use of it. On the other hand if the assumptions of the model can all be justified then it would be extremely useful at least as a start towards representing what is really going on.
Rating	very good

Additional Comments

Comments	In summary, I think that the proposed project is definitely worth doing, even if the outcomes are not perfect in terms of representing reality. I am not so sure about whether it should cost so much, and given the considerable cost I wonder whether it should not be started as a smaller feasibility type of study.
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Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	The track records of the authors are very good and they are certainly qualified to effectively implement the proposal. The infrastructure and support needed are available.
Rating	excellent

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	
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Technical Review #3

	As I state above, I think that the budget is very large for a modeling exercise without any expensive experimental work required.
Rating	fair

Overall

Provide a brief explanation of your summary rating.

Comments	The project is interesting and worth carrying out. The researchers are well qualified for the work. The outcomes should be useful to managers. I am not sure whether the outcomes will be as useful as the authors suggest, but it is worth finding out. The project is very expensive for a modeling exercise, and I wonder whether some sort of less expensive feasibility study should be funded first to see what sort of results are obtained.
Rating	very good